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**Biagini**

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(54) **CHARGING DEVICE HAVING ADAPTIVE INPUT**

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(56) **References Cited**

U.S. PATENT DOCUMENTS

2004/0217746 A1\* 11/2004 Thiery ..... H02M 1/425  
323/282  
2007/0159141 A1\* 7/2007 Shih ..... G05F 1/70  
323/207

(Continued)

FOREIGN PATENT DOCUMENTS

CN 201594757 9/2010  
CN 202142879 2/2012

OTHER PUBLICATIONS

Su et al: "Current source inverter based traction drive for EV battery charging applications", 2011 IEEE Vehicle Power and Propulsion Conference, 12339364, 2011, pp. 1-6, XP002692761, Pistacaway, NJ, USA DOI: 10.1109/vppc.2011.6043143 ISBN: 978-1-61284-248-6.

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(57) **ABSTRACT**

The invention relates to a charging device (2) for a battery (5) of a motorized device, suitable for being supplied by a single-phase alternating input current, and suitable for being supplied by a multi-phase alternating input current, said charging device (2) including a first conversion module (3) and a second conversion module (4), the first conversion module (3) being suitable for converting an alternating current into at least one intermediate direct current and of supplying the second conversion module (4) with said intermediate current, and the second conversion module (4) being suitable for converting the intermediate current into a

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